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FACTORS DETERMINING DRIP-IRRIGATION SYSTEM IN INDIAN AGRICULTURE – EVIDENCE FROM SUGARCANE CULTIVATORS

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ABSTRACT

Sugarcane plays an important role in giving good revenue for the farmers who cultivate, it as main a crop. At this juncture, the drip-irrigation system is most needed to the farmers who cultivate this variety of sugarcane. They could get more assistance and advice from the agriculture department for getting high yield. These sugarcane become raw material for many sugar industries in India. Drip irrigation systems are expensive because of their requirement of large quantity of piping and filtration equipment to clean the water. However, the cost of drip irrigation system varies considerably depending on the crop and terrain. Steep terrain may require several pressure regulators in the system. The present study aimed that to know the major factors which induce the sugarcane farmers to implement drip-irrigation system in Erode district.

INTRODUCTION

Drip-irrigation systems were once the standard for watering lawns and crops - until drought, water shortages and improved understanding of how plant diseases work encouraged the development of more efficient watering methods. Of course, high-tech manufacturers have soon entered the market to provide this gentler, better-targeted irrigation, declaring its superiority to sprinklers and soaker hoses alike. These new low-pressure systems provide improved water usage but, unfortunately, have their own problems. A drip system provides water where it's needed, but because of its low pressure, careful regulation must provide enough water to encourage healthy root development. Agriculture is one of the most significant sectors of the Indian Economy. Agriculture is the

only means of living for almost two thirds of the workers in India. The agriculture sector of India has occupied 43% of India's geographical area, and is contributing 16.1% of India's GDP. Agriculture still contributes significantly to India's GDP despite decline of its share in India's GDP. There are number of crops grown by farmers. These include different food crops, commercial crops, oil seeds, and so on. Sugarcane is one of the important commercial crops grown in India. Sugarcane is the main source of sugar in Asia and Europe. Sugarcane is grown primarily in the tropical and sub-tropical zones of the southern hemisphere. Sugarcane is the raw material for the production of white sugar, jaggery (gur) and khandsari. It is also used for chewing and extraction of juice for beverage purpose. The sugarcane cultivation and sugar industry in India plays a vital role towards socio-economic development in the rural areas by mobilizing rural resources and generating higher income and employment opportunities.

Drip irrigation is a technique in which water flows through a filter into special drip pipes, with emitters located at different spacing. Water is distributed through the emitters directly into the soil near the roots through a special slow-release device. If the drip irrigation system is properly designed, installed, and managed, drip irrigation may help achieve water conservation by reducing evaporation and deep drainage. Compared to other types of irrigation systems such as flood or overhead sprinklers, water can be more precisely applied to the plant roots. In addition, drip can eliminate many diseases that are spread through irrigation water. Drip irrigation is adaptable to any farmable slope and is suitable for most soils. In contrary to commercial drip irrigation, simple self-made systems are cheap and effective. Subsurface irrigation has been around since the 1860s, but drip irrigation was not a practical choice until Chapin developed lay-flat twin-wall drip tape in the late 1960s. Early problems with clogged lines, slime, and an inability to run nutrients through the lines have basically been solved as long as growers use a few precautionary tools to guard against problems. A well designed drip irrigation system benefits the environment by conserving water and fertilizer. A properly installed drip system can save as much as 80% of the water normally used in other types of irrigation systems. Water is applied either on the surface, next to the plant, or subsurface, near the root zone. In dry years, fewer weed seeds germinate between rows because there is less water available beyond the plant root zone. Another advantage to drip irrigation is that there is less evaporation from the soil, especially when drip irrigation is used with plastic mulch. Water is applied more evenly throughout the field, thus eliminating the need to run the irrigation longer to wet the whole field. It requires some expertise to install and operate a drip system and consultation with a knowledgeable professional. Drip irrigation systems are expensive because of their requirement of large quantity of piping and filtration equipment to clean the water. However, the cost of drip irrigation system varies considerably depending on the crop and terrain. Steep terrain may require several pressure regulators in the system. In many situations, the benefits of the drip system will usually overweigh the cost of the system, when compared to other methods of irrigation. Selecting widely spaced crops of high market value is necessary to increase the benefit-cost ratio in drip irrigation. Under average field conditions, the major components of the total cost of the system lie in the number of laterals/and emitters of the system. Evidently, both these items will be low in orchards and other widely spaced row crops.

MATERIALS AND METHODS

Arunadevi (2006) stated that irrigation of water is one of the important and scarce inputs in mulberry cultivation, which governs leaf quality and water, fertilizer saving can be improved by adopting drip fertigation. Farmers are advised to adopt 'Drip system' of irrigation in mulberry cultivation and improve their earning over 200% from the present level. Adya Prasad Pandey (2007) stated that Indian sugar industry is a second largest agro-based processing industry after cotton textiles industry in country, has a lion's share in accelerating industrialization process and bringing socio-economic changes in under developed rural areas. Sugar industry covers around 7.5% of total rural population and provides employment to 5 lakh rural people. About 4.5 crore farmers are engaged in sugarcane cultivation in India. Sugar mills (cooperative, private, and public) have been instrumental in initiating a number of entrepreneurial activities in rural India. Present paper is an attempt as to review progress of sugar industry in India, understand its problems and challenges in context of ongoing liberalization process. Indian sugar industry can be a global leader provided it comes out of the vicious cycle of shortage and surplus of sugarcane, lower sugarcane yield, and lower sugar recovery, ever increasing production costs and mounting losses. It needs quality management at all levels of activity to enhance productivity and production. Attention is required on cost minimization and undertaking by product processing activities. The validity of any research depends on the systematic method of collecting the data, and analyzing the same in a sequential order. In the present study, extensive uses of both primary and secondary data were made. For collecting the primary data, field survey technique was employed in the study. First-hand information was collected from 500 respondents of agriculture sector in Erode district. Stratified random sampling method was employed for selecting the respondents from the selected District. Factor analysis was employed for further analysis. Factor Analysis is a method used to transform a set of variables into a small number of linear composites, which have a maximum correlation with original variables. Factor analysis is used to study a complex product (or) service in order to identify the major characteristics or factors considered important by the respondents. The purpose of factor analysis is to determine whether the responses of several statements favored by the respondents are significantly correlated. If the responses to the several statements are significantly correlated, it is considered that the statement measures some factors common to all of them.

RESULTS AND DISCUSSIONS

The factors influence the respondents to produce sugarcane by drip-irrigation, is studied by measuring factors through 12 statements of cognitive components, affective component and co native components. These 12 statements are chosen and classified in an orderly form, and factor analysis is employed and the detailed analysis and discussions are done at various stages.

Table 1: *KMO and Bartlett's Test*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	Bartlett's Test of Sphericity		
	Approx. Chi-Square	Df	Sig.
0.852	2594.469	66	0.000

The above table shows the results of Bartlett's test of sphericity and Kaiser Meyer Olkin measures of sample adequacy are used to test the appropriateness of the factor model. Bartlett's test is used to test the null hypothesis that the variables of this study are not correlated. Since the appropriate chi-square value is 2594.469 which are significant at 1% level, the test leads to the rejection of the null hypothesis.

The value of KMO statistics (0.852) is also large and it revealed that factor analysis may be considered as an appropriate technique for analyzing the correlation matrix. The following communality table shows the initial and extraction values.

Table 2: *Communalities*

VARIABLES	INITIAL	EXTRACTION
High Yield	1.000	.498
Availability of water	1.000	.524
Low Risk	1.000	.562
Increase Quality of Product	1.000	.647
Suitability of Climate	1.000	.655
Availability of Bank Loan	1.000	.622
Low Cost of Production	1.000	.612
Less labour Requirements	1.000	.553
Government support & Subsidy	1.000	.687
Low diseases	1.000	.363
Less Wastage of Fertilizer	1.000	.672
Reducing Weed Problem	1.000	.526

The table of communalities before and after extraction, Principle component analysis works on the initial assumption that all variance is common, therefore before extraction the communalities are all 1. The communalities in the column labeled. Extraction reflect the common variance in the data structure .it is said that 49.8% of the variance associated with 1 is common are shared variance. The large communalities means a large amount of the variance a variable has extracted by the factor solution. It shows that variable with comparatively higher value is well- represented in the common factor space, while the low value variables are not. Thus the extracted communalities are high and acceptable for all the variables.

Table 3: *Total Variance Explained*

Component	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of Squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4.886	40.714	40.714	4.886	40.714	40.714	4.612	38.436	38.436
2	2.036	16.963	57.678	2.036	16.963	57.678	2.309	19.242	57.678

3	.888	7.401	65.079						
4	.758	6.319	71.398						
5	.628	5.235	76.633						
6	.592	4.935	81.568						
7	.470	3.914	85.482						
8	.462	3.853	89.335						
9	.409	3.405	92.740						
10	.338	2.816	95.556						
11	.296	2.469	98.025						
12	.237	1.975	100.00						

Extraction Method: *Principal Component Analysis.*

From the above table it is observed that the labeled "Initial Eigen values" gives the Eigen values. The Eigen value for a factor indicates the "Total Variance" attributed to the factor. From the extraction sum of squared loadings, it is learnt that the first factor accounted for a variance 4.886 which was 40.714 percent; the second factor accounts for the variance 2.036 which is 16.963 percent. The two factors put together show the total percentage of the variance with 57.678 percent. In this approach only factors with Eigen values greater than 1.00 are retained and the other factors are not included in this model. The two components possessing the Eigen values which are greater than 1.00 are taken as the components extracted.

Hence, to show the components loading which are the correlations between the variables and the component matrix is presented in the following table.

Table 4: *Component Matrix*

Variables	Component	
High Yield	.692	-.138
Availability of water	.701	-.180
Low Risk	.748	-.050
Increase Quality of Product	.770	-.234
Suitability of Climate	.805	-.083
Availability of Bank Loan	.764	-.196
Low Cost of Production	.763	-.173
Less labour Requirements	.738	-.089
Government support & Subsidy	.305	.770
Low diseases	.238	.554
Less Wastage of Fertilizer	.344	.744
Reducing Weed Problem	.369	.624

Extraction Method: *Principal Component Analysis.* a. 2 components extracted

Table 5: *Rotated Component Matrix*

Variables	Component	
High Yield	.701	.083
Availability of water	.722	.046
Low Risk	.727	.184
Increase Quality of Product	.805	.016
Suitability of Climate	.791	.171
Availability of Bank Loan	.787	.050
Low Cost of Production	.779	.072
Less labour Requirements	.729	.144
Government support & Subsidy	.052	.827
Low diseases	.055	.600
Less Wastage of Fertilizer	.096	.814
Reducing Weed Problem	.158	.708

The rotated component matrix shown in the above table is a result of VARIMAX procedure of factor rotation. Interpretation is facilitated by identifying the variables that have large loadings on the same factor. Hence, those factors with high factor loadings in each component i.e. values greater than 0.4 are selected. The selected factors are named separately and highlighted in the following table. The factor loading of all the variables was observed and clubbed into two factors, which is presented in the following table. This matrix contains the same information as the component matrix. Except that, it is calculated after rotation.

Table 6: *Naming of Statements Extracted*

Factor & % of Total variance	***Va. No.***	***Statements***	***Rotated Factor Loadings***
Eminent (40.714%)	*1*	*High Yield*	*.701*
	2	*Availability of water*	*.722*
	3	*Low Risk*	*.727*
	4	*Increase Quality of Product*	*.805*
	5	*Suitability of Climate*	*.791*
	6	*Availability of Bank Loan*	*.787*
	7	*Low Cost of Production*	*.779*
	8	*Less labour Requirements*	*.729*
Stumpy (16.963%)	*9*	*Government support & Subsidy*	*.827*
	10	*Low diseases*	*.600*
	11	*Less Wastage of Fertilizer*	*.814*
	12	*Reducing Weed Problem*	*.708*

In the above table the statements 1,2,3,4,5,6,7 and 8 are grouped together as factor 1 and accounted for 40.714% of the total variance and are named as 'Eminent'. The

statements, 9, 10, 11 and 12 are grouped together as factor 2 and accounted for 16.963% of the total variance and is named as 'Stumpy '. Thus the factor analysis condenses and simplifies the 12 statements and grouped them into 2 factors explaining 57.678 % of the variability of all the statements. From the analysis, it is evident that out of 12 statements, all the statements are grouped into 2 component factors and are termed as Eminent and Stumpy.

SUGGESTIONS AND CONCLUSION

Sugar industry is an important agro-based industry that impacts rural livelihood of about 50 million sugarcane farmers and around 5 lakh workers directly employed in sugar mills. Employment is also generated in various ancillary activities relating to transport, trade servicing of machinery and supply of agriculture inputs. India is the second largest producer of sugar in the world after Brazil and is also the largest consumer. Sugarcane plays an important role in giving good revenue for the farmers who cultivate, it as main a crop. Sugarcane is the main commercial crop in Erode district. Its water requirement is the highest among the crops grown in this zone. This crop requires 1700 to 1900 mm water during its growth period. The timing of application of water as well as total water requirement are the important factors influencing crop production. At this juncture, the drip-irrigation system is most needed to the farmers who cultivate this variety of sugarcane. They could get more assistance and advice from the agriculture department for getting high yield. These sugarcane become raw material for many sugar industries in India. Drip-irrigation systems were once the standard for watering lawns and crops -- until drought, water shortages and improved understanding of how plant diseases work encouraged the development of more efficient watering methods. To be adequate a system must have the capacity to meet the peak use requirements of the crops to be grown and to deliver water at the peak rate required for the irrigation method used. It should be planned and designed to operate at high efficiency to conserve irrigation water. Conservation irrigation, like other farm operations, must be undertaken only if it can be done successfully and at profit. Drip irrigation normally wets only a part of the root zone. Hence, the root distribution is almost limited to the moist zone. Many factors, involving soil and plant characteristics, management practices and the design of the irrigation system influence the root development of crops. The concentrated distribution of roots may reduce the plants ability to withstand strong winds.

REFERENCES

[1] Adya Prasad Pandey, Indian Sugar Industry - a Strong Industrial Base for Rural India, MPRA, Banaras Hindu University Dec 2007.

[2] Arunadevi "Mulberry Cultivation under Drip Fertigation", Kisan World, May 2006, pp. 51-52.

[3] Caswell, Margriet, and David Zilberman, "The Choices of Irrigation Technologies in California," *American Journal of Agricultural Economics, 67*(2), 1985, pp. 224-239.

[4] Dukes, M. D., D. Z. Haman, F. R., Lamm, J. R. Buchanan, and C. R. Camp, "Site selection for subsurface drip irrigation systems in the humid region". *In Proc, World Water and Environmental Resources Congress, (173),* pp. 558.

[5] Edstrom, J., and L. Schwankl. 1998. Weed suppression in almond orchards using subsurface drip irrigation. *Abstract for 51st Mtg. Western Soc. of Weed Science,* 35-36. Las Cruces, N.M.: Western Society of Weed Science.

[6] Laxmi and A. Kumar, "Weather based forecasting for crops yield using neural network approach," *Statistics and Application, Vol. 9,* No. 2, 2011, pp 55–59.

[7] Phene, C. J., Shovel versus computer. *Irrigation Business and Technology, 4* (3), 1996, pp. 6.

[8] Scheuring, Ann F., *"Sustaining Comradeship: The Story of University of California Cooperative Extension, 1913-1988."* Regents of the University of California.

[9] Tian, F.; Yang, P.; Hu, H.; Dai, C. Partitioning of Cotton Field Evapotranspiration under Mulched Drip Irrigation Based on a Dual Crop Coefficient Model. *Water* 2016, *8*, 72.